

Chapter 24

SANITARY SEWER DESIGN CRITERIA

INTRODUCTION

This chapter presents the criteria, standards and regulations related to the design of sanitary sewer systems for general development service. It does not cover the criteria necessary for design of major interceptor sewers, lift stations, or treatment facilities. The material is directed to the competent design professional and is not intended to be a detailed design handbook. Criteria and standards presented are those determined to be the minimum acceptable values necessary to result in system designs having satisfactory functional characteristics, durability and operational suitability. It is expected that the designer will strive for the best design to suit the circumstances involved, and that designs will reflect sound professional judgement at all times.

Section 1. GOVERNING REGULATIONS

Ordinances, policies and procedures related to the design and operation of sanitary sewer systems include the following:

A. Regulations and Plans

City of Albuquerque Standard Specifications for Public Works Construction

This document contains the General Conditions, material and construction specifications, and construction details required for City Public Works construction.

Subdivision Ordinance (Article 7-11 R.O. 1974)

This Ordinance primarily requires that sewer service be available to proposed developments before issuance of building permits. There are no specific design criteria included in this Ordinance. However, the provisions contained in the DPM have the same effect as those in the Subdivision Ordinance. (See 14-14-1-10 Rulemaking)

Water and Sewer Rates (Article 8-4 R.O. 1974)

This Ordinance relates to the revenue system for water and sewer service. This Ordinance contains no specific design criteria.

Water and Sewer System Expansion Policies (Council Bill R-390, Enactment No. 20-1984)

Adopted by the City Council on February 6, 1984

These policies are generally to regulate and control the development, extension and expansion, including connection, of water and sewer facilities to serve development in the City and immediate environs. They include policies relating to the distribution of costs for such extensions and expansion

B. Availability Statements

(Planning Department/Utility Development Section Administrative Procedure)

A Water and Sanitary Sewer Availability Statement issued by the Planning Department/ Utility Development Section within the past 12 months is required for any proposed development, subdivision plat, or site plan within the City or for anyone contemplating service in Bernalillo County. Availability Statements identify the water and sanitary sewer infrastructure needs (public/private, on/off site) to provide a proposed development with services and fire protection. In addition, any time constraints for development plans, or requirement for annexation to receive services, will be identified in the Statement.

A request for an Availability Statement shall be made as early as possible in the planning of a project to allow sufficient time for response and to enable the developer to include the necessary water and sanitary sewer infrastructure in the project plans. Requests for Availability Statements should include the following information:

1. The precise location of the proposed development, with a marked Zone Atlas map or legal description of the property.
2. The type of development proposed, such as single family residential, shopping center, office, etc., with a proposed schedule of development or phasing, if applicable.
3. The scope or size of the project and utility demands, if known (e.g. the number of units in a residential project, number of beds in a nursing facility, square footage for a shopping center or industrial development, etc.).

4. A copy of the Instantaneous Fire Flow Requirements from the Fire Marshal's Office. If a private sprinkler system is to be installed, state the flow requirements for that system, as well.
5. Any other information pertinent to project planning.

Requests for Availability Statements on Water and Sewer Service should be addressed to:

City of Albuquerque
 Planning Dept./Utility Development Section,
 Development and Building Services
 600 Second Street NW,
 Albuquerque, New Mexico 87102
 Phone (505) 924-3900

In cases of complicated or very large development proposals, additional study time may be required to prepare an Availability Statement. In such cases, the requester shall be notified of the extra time needed and advised of the status of the statement.

Where a proposed project is not sufficiently defined to provide all of the information required for an Availability Statement, the developer may request a Serviceability Letter in an effort to identify the water and sewer utilities nearest to the property and to ascertain the general feasibility of the project. However, in no case shall a Serviceability Letter replace the need for an Availability Statement.

No water or sanitary sewer service accounts shall be sold to any development project prior to issuance of a Water and Sanitary Sewer Availability Statement for that specific project. No property may develop or take service in such a manner that leaves adjacent unserved properties without means to obtain service. In accordance with the Water and Sewer Expansion Policies, line extensions are required to cover all frontage of the property requesting service unless all adjacent properties have other means of being served.

Section 2. ENGINEERING DESIGN CRITERIA

Unless modified for a specific project, specifications for pipe and other construction materials and specifications for construction will be as required in the current City of Albuquerque Standard Specifications for Public Works Construction and Standard Details.

A. Design Capacity Criteria Section, Development and Development Service

1. Off-site flows will be typically determined by the Planning Department /Utility Development.

2. In areas with a mix of residential, commercial, industrial, etc., roughly representative of the city as a whole, the population of the contributing area is determined and the design flows are calculated as follows:

Average	Flow	=	110 X Population/10 ⁶ , in MGD
Peak	Flow	=	2.5 X (Avg.) ^{.8875} , in MGD
Design	Flow	=	1.2 X Peak, in MGD
			(for cfs, multiply MGD by 1.547)

3. Population loadings are assumed to be:

2.5 persons per DU for apartments, townhouses and mobile homes

3.0 persons per DU for R-1 single-family homes

Where DU = Dwelling Unit

4. In primarily non-residential areas, design flows are determined by other methods as may be appropriate with the approval of the Planning Department/Utility Development, Development & Building Services Center. Following is a summary of non-residential sewer use categories and estimated demand currently used by City staff in the Albuquerque Sewer Analysis Model (ASAM) of the City's major sewer lines:

NOTE: The following land use categories and associated sewer use loading values are established for use with development within the City of Albuquerque Wastewater collection basin. The Land Use Categories relate to standard "Sewer Use Unit Hydrographs" within the City's computer model of the sewer system, Albuquerque Sewer Analysis Model (ASAM). Alternative loading may be considered or required when justified for a specific development. Impact fees analysis may reflect variations in flows.

LAND USE CATEGORY	AVERAGE FLOW	PEAK FLOW
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	(gpd / Acre)	(gpd / Acre)
Light Commercial	1,230	1,621
Heavy Commercial	5,968	7,600
Light Institutional	226	310
Heavy Institutional	1,788	2,448
Light Industrial	447	745
Medium Industrial	1,680	1,982
Heavy Industrial	9,266	10,300

Section 4 of this chapter contains a detailed listing of Land Use Codes and classifications for nearly all possible developed uses, as they are applied in ASAM. Contact Planning Department / Utility Development for assistance in applying rates and determining applicable loading.

5. Design is for full pipe flow at the design flow.
6. Manning's Formula is to be used for determination of pipe flow velocities and capacities using a value for Manning's "n" = 0.013.

- a. Peak velocity = Velocity at peak flow conditions
- b. Average velocity = Velocity at average flow conditions

B. Manhole Criteria

1. Manholes must generally be located on the centerline of street right-of-way or of street width if the street is not concentric with the right-of-way. Manholes for straight lines in curved streets may be located as much as 5' off from centerline of street or right-of-way; however, required clearances from other utilities must be maintained. The offset of such manholes is to be dimensioned from center of manhole barrel to the centerline of the street or right-of-way. In narrow, curving, residential streets, greater than 5' offset may be appropriate to maintain separation from other utilities. Avoid locating manholes in the "wheel path" on arterial and collector roadways, and keep them out of "Parking" lanes and spaces. Manhole locations that conflict with centerline monumentation required for subdivisions, should be shifted, when practical, to eliminate the conflict. Manholes will not be allowed outside of public right-of-way within residential areas except in private streets or within multifamily housing with public easements. All manholes must be accessible by sewer maintenance truck. Manhole locations in residential rear or side yards are not acceptable.

2. Standard minimum manhole depth is 6.0', measured from rim to invert. Manhole depths greater than 20 feet shall be avoided.

3. The required inside diameter for a manhole is determined as follows:

- a. Minimum inside diameter is 4.0'.
- b. A minimum 9" wide shelf must be provided on each side of each main line within the manhole.

- c. Where the main flow changes direction at a manhole, the manhole must be large enough so that the centerline radius of a curvature of the flow invert will be larger than the pipe diameter.

MINIMUM MANHOLE DIAMETERS REQUIRED FOR DIRECTION CHANGES

Degrees of Direction Change								
Pipe ID	0°	5°	45°	50°	75°	80°	85°	90°
21"	4'	4'	4'	4'	4'	4'	4'	4'
24"	4'	4'	4'	4'	4'	4'	4'	6'
27"	4'	4'	4'	4'	4'	4'	6'	6'
30"	4'	4'	4'	4'	4'	6'	6'	6'
36"	6'	6'	6'	6'	[..... NOT PERMITTED]			
42"	6'	6'	6'	[..... NOT PERMITTED]				

4. Flow will not be permitted to change horizontal flow direction by more than 90° in a manhole. Under the following conditions, the maximum horizontal change in flow direction permitted will be 50° although special design considerations will be made where the situation warrants:

- a. All lines larger than 36".
 - b. Any lines with a design flow greater than 3.0 MGD and a design velocity of 5.0 fps or greater.
 - c. Any junction of two flows, each with design flow greater than 3.0 MGD, where one line has a design pipe velocity of 5.0 fps or greater.
5. Invert elevations will be called out for each inlet and outlet at a manhole.
6. Drops across manholes will be provided as follows:
 - a. Where the main flow does not change direction at the manhole, the design will provide:
 - (1) A slope across the manhole at least equal to the average of the slopes of the incoming and outgoing lines.
 - (2) The minimum drop will be 0.05' for lines 36" and smaller.
 - b. Where the main flow changes direction at the manhole, the design will maintain the average of the slopes of the incoming and outgoing lines and compensate for the loss of velocity head caused by the turn.
 - (1) The slope component will be equal to the average of the slopes of the incoming and outgoing lines times the diameter of the manhole.
 - (2) The velocity head component will be determined by the following formula:

$$hb = KB \frac{V^2}{2g}$$

where:

hb = required drop to compensate for loss of velocity head (feet).
 KB = bend coefficient, use 0.4 for 90° turn, 0.32 for 45° turn and linear proportioning for other deflection angles (dimensionless).
 V = design velocity of incoming line based on design flow, ft/sec.
 g = 32.17 ft/sec².
 - (3) The total drop required through the manhole will be the sum of the slope component and velocity head component.
 - (4) The minimum drop through a manhole will be 0.10'.
 - c. Where flows converge at a manhole, the inverts should be designed to produce a smooth water surface at design flow with no backwater conditions in any of the incoming lines. Excessive drops, which cause turbulence, are to be avoided.
 - d. The use of drop connections to manholes (drop manholes) will require Planning Department/Utility Development Division approval; drop manholes shall conform to Standard Details.
7. Drop manholes and other manholes with high potential of sulfide gas generation must be designed with corrosion resistant interior walls, when directed by Public Works Department (PWD) or Utility Development.
8. The maximum distance allowed between manholes is:
 - a. 8" to 21" mains - 450' maximum
 - b. 24" & larger - 500' maximum for average velocities of 3.0 fps or less
 9. When an interim line extension is to be built for a distance less than the reasonable spacing for a manhole installation, the Utility Development representative to Development Review Committee (DRC) may allow installation of a plug. The design drawings for such installation must provide a design to the next anticipated, upstream manhole location, with line and manhole beyond the temporary clean out depicted as "Future."
- C. Line Criteria
 1. Sanitary sewer materials must comply with the requirements set forth in the City of Albuquerque Standard Specifications for Public Works Construction and the Standard Details, latest edition.
 2. Minimum line size allowed: 8" inside diameter.
 3. The minimum slope considered necessary in non-curve linear lines shall provide a minimum design velocity of 2.2 ft/sec. GREATER SLOPES THAN MINIMUM ARE DESIRABLE AND ARE TO BE PROVIDED WHERE POSSIBLE. Maximum slopes should never result in super critical flow.
 4. Sections of line that are flat relative to the upstream line are to be avoided. As much as possible, continuous flow velocity and capacity will be provided. The energy gradient should slope

generally parallel to the slope of the invert with no abrupt changes nor slopes opposite to the direction of flow.

5. Line depth should be sufficient to provide gravity service to property contiguous to the line. Additional depth may be required to provide for service. Generally, house services shall be a minimum of 4' below the top of curb at the property line as measured from the top of curb to the invert of the services.

6. The main lines are to be located within public right-of-way except as noted in subsection 7, following, and are to be aligned in accordance with the Primary Utility Locations, Figures 1-5. Where the Primary Utility Locations do not apply, the following criteria apply:

a. The New Mexico Environment Department policy on the proximity of water and sewer lines, with City amendments as follows:

- Sewer lines should be laid at least 10 feet horizontally from any existing or proposed water main. In situations where it is not feasible to maintain a 10-foot separation, the distance may be reduced on a case-by-case basis, if supported by information from the Design Engineer. The water main must be in a separate trench or on an undisturbed earth shelf located on one side of the sewer line and at an elevation such that the bottom of the water main is at least 18 inches above the top of the sewer line.

- Sewer lines crossing water mains should be laid to provide a minimum vertical separation of 18 inches between the outside of the water main and the outside of the sewer line. This separation should be maintained where the water main is either above or below the sewer line. The crossing should be arranged so that the sewer line joints will be equidistant and as far as possible from the water main (~10 feet).

- When it is impractical to obtain proper horizontal and vertical separation, the sewer line should be designed and constructed of pressure rated (125 psi), plastic pipe, and should be pressure tested similar to a water line to assure water tightness. When pressure rated pipe is required for a sewer crossing, it shall be installed the entire distance between the adjacent manholes.

b. Main lines must be located so that they can be maintained without disturbing any sidewalk, curb, gutter or any other utility. The required trench must be totally within the paved roadway or utility easement.

c. Written approval of the Utility Development representative to the DRC must be obtained for any deviations from the Primary Utility Locations.

7. Sanitary sewer main lines may be located outside public right-of-way only under the following conditions:

a. Prior written approval is given by the DRC Utility Development representative.

b. The main line must be located as follows:

- (1) In a paved, permanent access easement, or
- (2) In a planned landscaped area with access suitable for sewer line maintenance equipment. Trees shall NOT be planted within 10' of the centerline of the sewer.
- (3) If (1) and/or (2) above are impossible due to prior platting, the situation will be handled as a special case.

c. A permanent easement will be granted for exclusive use of water and sanitary sewer, unless shared use with other utilities is coordinated and approved in advance by the DRB or DRC Utility Development representative. A minimum width easement of 20' is required for a single utility and 25' for water and sewer. Additional easement width may be required where soil type, trench depth, or other conditions dictate greater trench width. Appropriate forms of easement dedication language are available at the Planning Department/Utility Development .

d. Compliance with the New Mexico Environment Department policy on the proximity of water and sewer lines. City amendments noted in subsection 2.C.6, above, must be achieved.

e. In private streets, Primary Utility Locations apply.

f. No manholes are to be located outside of roadways unless provisions are constructed for sewer maintenance truck access.

8. In developments where sewer mains and/or services are constructed and the developer files a replat, these facilities will be reconstructed and/or relocated to conform to these guidelines unless an exception is granted by the Planning Department/Utility Development.

9. A sanitary sewer interceptor is a sanitary sewer that receives flow from a number of collectors, large sewers, or outlets, and conducts the waters to a point for treatment or disposal. For public

line connections to sanitary sewers classified as interceptors, the following shall apply except in special cases or as approved by Utility Development:

- a. Public line connection to the interceptor shall be made at a manhole.
- b. At the manhole, the hydraulic grade line (HGL) of the connecting line shall match or be above the HGL of the interceptor. In lieu of HGL determination, the invert of the connecting line shall match the soffit of the interceptor.
- c. To trap sewer gases, an inverted siphon may be required at public line connections to the interceptor manhole.

D. Curvilinear Sewers

Straight line sewers shall be utilized as much as possible. Straight line systems are often possible with no increase in the number of manholes by allowing the line to vary a maximum of 5' to the inside or outside of the centerline, depending on the location of the water line and of other utilities.

Curvilinear sewers are permitted, in accordance with the following criteria:

1. The pipe length to be used, deflection angle, joint length and offset, and radius of curvature must be stated on the plans.
2. Manholes must not be placed within 5' of the beginning and the end of street centerline curves, to allow for street centerline monumentation.
3. The minimum radius of curvature is:

Pipe Type	Pipe Diameter	Joint Length (NOM)	MINIMUM Radius
DIP	8" - 12"	18'	300'
PVC	8"	20'	275'
PVC	10"	20'	330'
PVC	12"	20'	400'
VCP	8" - 12"	4'	130'
VCP	8" - 12"	6'	200'

4. The maximum distance between manholes on a curvilinear sewer is 300'.
5. The slope of the curvilinear sewer must be at least 5% greater than the upstream straight line sewer. Additionally, the minimum slope criteria for curvilinear sewers is shown below:

SEWER I.D.	SLOPE
8"	0.0066
10"	0.0030
12"	0.0024
15"	0.0018

E. Service Connections Criteria

(Private collection systems and individual service connections).

1. Service connections must be made to the main line except at the end of cul-de-sacs where connection to a manhole is permitted in the manner shown in the Standard Detail Drawings.
2. Service connections to a manhole are to be made with the invert of the service at the elevation of the top of the main line.
3. Service connections to mains will be constructed as follows:.

Service Size	Main Size	Connection Method
4"	8"	Insert manufactured TEE/WYE
4"	8"	Core drill main and install saddle
6"	8"	Insert manufactured TEE/WYE
6"	8"	Install manhole
6"	10" and greater	Insert manufactured TEE/WYE
6"	10" and greater	Core drill main and install saddle
8"	8" and greater	Install manhole

4. Drop connections at manholes shall be constructed as shown on Standard Details.
5. Service connections are not to be made to lines with peak design flow capacity greater than 3.0 MGD.

6. All service connections shall be made such that the service is perpendicular or radial to the sewer main.

7. All service connections shall have a minimum slope of 1/4" per foot toward the main within the public right-of-way and shall have a minimum depth of 4' below the top of curb elevation from the finished surface projected to the property line measured to the pipe invert.

Section 3. FIGURES

Figure 24.1: Primary Utility Locations - Arterial Streets (106' R/W)

Figure 24.2: Primary Utility Locations - Collector Streets (86' R/W)

Figure 24.3: Primary Utility Locations - Collector Streets (66' R/W)

Figure 24.4: Primary Utility Locations - Residential Streets

Figure 24.5: Primary Utility Locations - Estate Type Street

Section 4. ASAM LAND USE CODES AND CLASSIFICATIONS FOR SEWER MODELING

The following pages contain a detailed listing of Land Use Codes and classifications for nearly all possible developed uses, as they are applied in ASAM. Contact Public Works Department / Utility Development for assistance in applying rates and determining applicable loadings.